

Legionella

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Legionella is an infection caused by the bacterium, *Legionella*, which resides primarily in aqueous environments. There are at least 20 different species of *Legionella* that have been implicated in human disease, but the majority of infections in the United States are due to *Legionella pneumophila* serogroup 1.

Two presentations of the disease exist. The more severe form, Legionnaires' disease, so named because of a large outbreak that occurred at a meeting of the American Legion in 1976, is characterized by pneumonia. Pontiac fever is a milder form of the disease, characterized by fever and muscle ache. Smokers, persons with chronic lung disease, and the immunosuppressed are considered to be at highest risk of contracting Legionellosis.

Legionella most commonly occurs as isolated cases, but outbreaks occasionally are identified, usually associated with warm water aerosols (the organisms thrive at 20°C to 45°C) originating from air conditioning systems, whirlpool spas, plumbing systems, and etcetera. Nosocomial infections also occur and give rise to the highest proportion of fatal cases. Person-to-person transmission does not take place.

Surveillance

Legionella is a Class B disease and must be reported to the state within one business day. All reported cases are entered into the Infectious Disease Reporting Information System (IDRIS). Data is extracted from IDRIS for analysis and compilation of Infectious Disease Annual Reports.

To supplement the data collected in IDRIS, data is also pulled from the Louisiana Inpatient Hospital Discharge Data (LaHIDD). In 1997, the Louisiana legislature mandated the reporting of hospital discharge data. LaHIDD serves as the state registry containing hospital discharge data submitted to the Department of Health and Hospitals (DHH). The data is available with a delay of two years. The Infectious Disease Epidemiology Section uses these data sets for the surveillance of infectious diseases in hospitals. LaHIDD data sets contain demographic information (names, gender, age, date of birth, address, admit diagnosis, discharge diagnoses (main plus eight more diagnoses), procedures (main plus five), charges, length of stay and hospital name. The diagnoses and procedures are coded with ICD-9 codes. Repeat hospitalizations are not included. Records of patients with Legionella were extracted using the following ICD9 code whether in the main diagnosis or in the eight additional secondary diagnoses: 48284 Legionnaires' Disease.

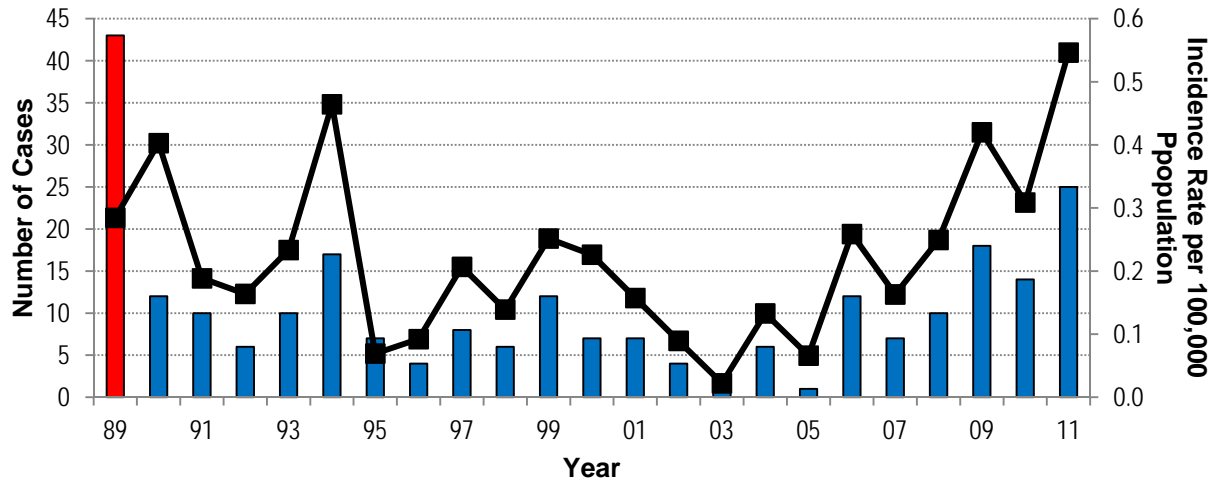
Incidence

According to the Centers for Disease Control and Prevention (CDC), an estimated 8,000 to 18,000 new cases occur yearly in the United States. Only a fraction of these cases (2%-10%) are reported.

An average of nine Legionella cases a year is reported in Louisiana. Forty-three cases were

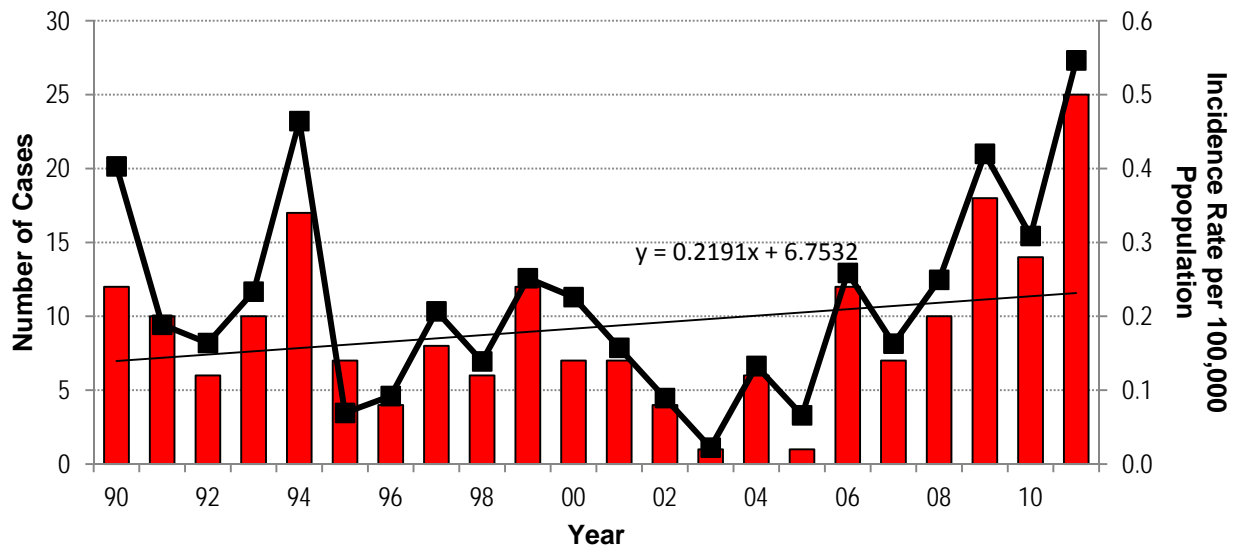
reported in Louisiana in 1989, including 33 associated with a large outbreak in Washington Parish (Figure 1).

Figure 1. Reported Legionella Cases and Incidence Rates per 100,000 Population Louisiana, 1989-2011



The decreased use of culturing may have a negative effect on recognition of infections caused by *Legionella* species, but outbreaks of *Legionella pneumophila*, serogroup 1 may be more easily recognized because of the use of non-invasive tests such as the urine antigen test. Discounting the 1989 outbreak, there has been a slight increasing trend in Legionellosis reports from 1990 to 2011 (Figure 2).

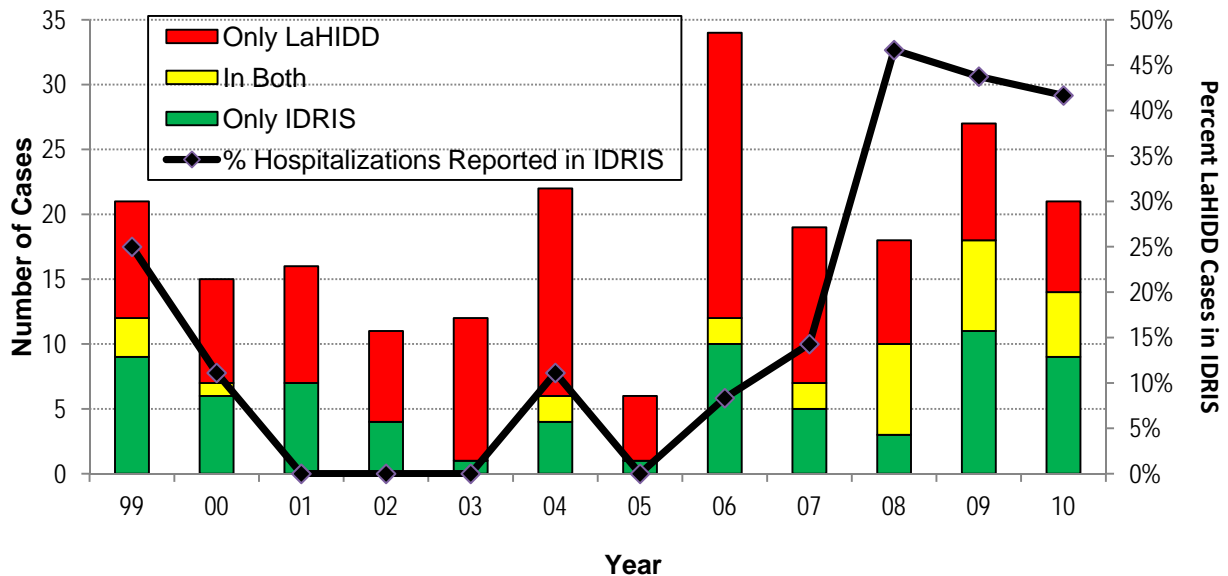
Figure 2. Reported Legionella Cases and Incidence Rates per 100,000 Population Louisiana, 1990-2011



Hospitalizations and Reporting

While *Legionella* is a reportable disease, not all cases are reported. Cases were pulled from both LaHIDD and IDRIS and matched by full name and date of birth in an attempt to gain a more accurate case count of all *Legionella* cases from 1999 to 2010. The percentage of *Legionella* hospitalizations that were reported varies from 0% to 46.7%. In recent years, the percent reported has increased compared to prior years (Figure 3).

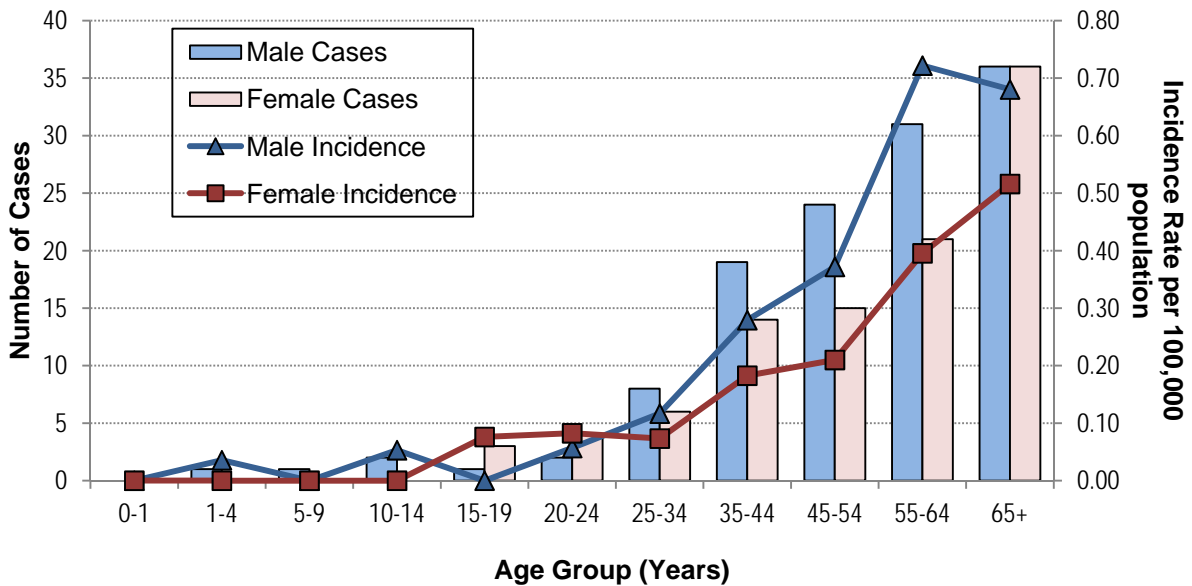
Figure 3. Comprehensive *Legionella* Case Count: Reported Cases, LaHIDD Cases, and % LaHIDD cases also reported in IDRIS – Louisiana, 1999-2010



Age, Gender and Race

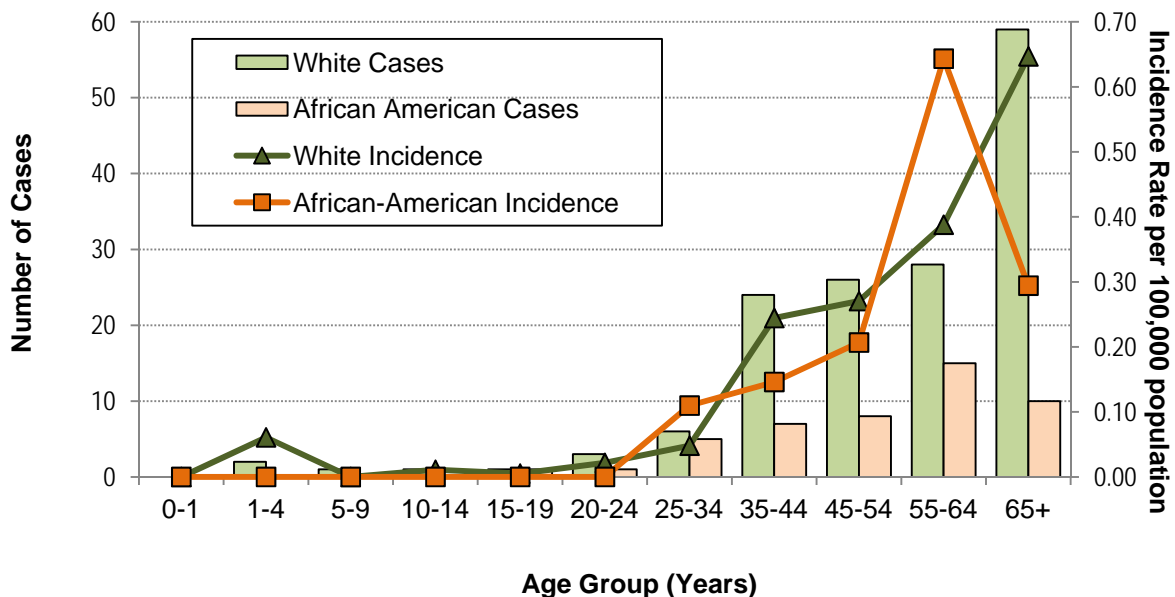
Legionella cases occur slightly more often among males than females, with an average of five cases a year among males and four cases a year among females (Pearson's chi-square, $p=0.035$). *Legionella* can affect people of all ages, but the majority of cases occur among people who are middle-aged or older (Figure 4).

Figure 4. Reported Legionella Cases and Incidence Rates per 100,000 Population by Gender and Age - Louisiana, 1990-2011



There is no significant difference in incidence rates between races except in the oldest age group of 65 or older, where incidence among Whites is higher (Pearson's chi-square, $p=0.029$). In Louisiana, an average of six cases occur a year among Whites and two cases a year among African-Americans (Figure 5).

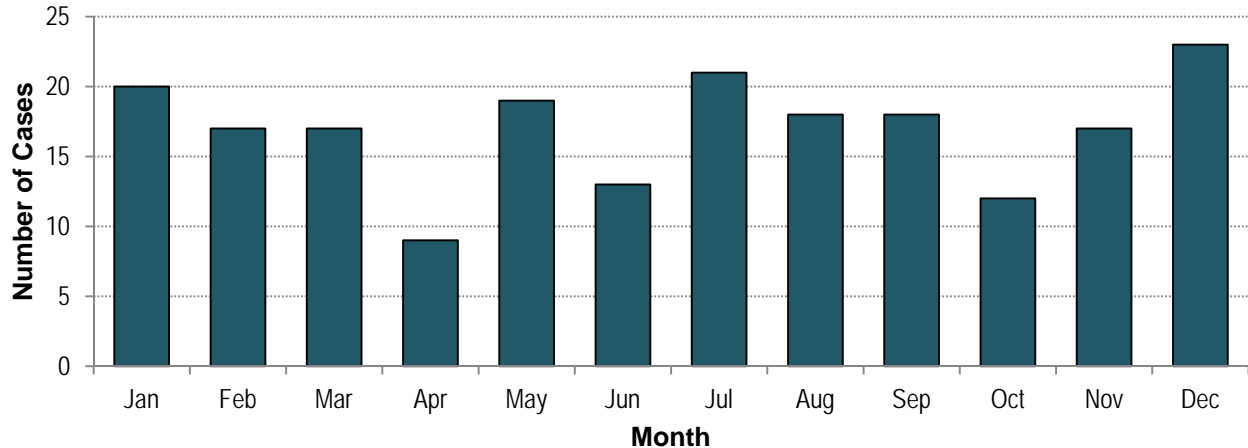
Figure 5. Reported Legionella Cases and Incidence Rates per 100,000 Population by Race and Age - Louisiana, 1990-2011



Seasonality

There is no seasonal variation among reported cases in Louisiana. (Figure 6)

Figure 6. Reported Legionella Cases by Month – Louisiana, 1990-2011



Legionella Cases by Parish

Higher numbers of cases occur in more populated parishes, however the highest case rates per 100,000 population (highlighted in yellow) occur in both rural and urban parishes (Table 1).

Table 1. Reported Legionella Cases by Parish - Louisiana, Total Number of Cases 1990-2000 and 2001-2011 Compared to the 1990-2011 Average Incidence Rate per 100,000 population

| Region | Parish | 1990-2000 Cases | 2001-2011 Cases | 1990-2011 Ave. Rate | Region | Parish | 1990-2000 Cases | 2001-2011 Cases | 1990-2011 Ave. Rate |
|--------|----------------|-----------------|-----------------|---------------------|--------|-----------|-----------------|-----------------|---------------------|
| 1 | Jefferson | 5 | 9 | 0.14 | 6 | Concordia | 0 | 0 | 0.00 |
| | Orleans | 14 | 23 | 0.50 | | Grant | 0 | 0 | 0.00 |
| | Plaquemines | 0 | 1 | 0.21 | | La Salle | 1 | 0 | 0.33 |
| | St. Bernard | 6 | 0 | 0.41 | | Rapides | 2 | 2 | 0.14 |
| 2 | Ascension | 2 | 0 | 0.14 | | Vernon | 0 | 0 | 0.00 |
| | E. Baton Rouge | 10 | 3 | 0.15 | | Winn | 0 | 0 | 0.00 |
| | E. Feliciana | 0 | 0 | 0.00 | 7 | Bienville | 0 | 1 | 0.32 |
| | Iberville | 0 | 1 | 0.13 | | Bossier | 0 | 2 | 0.08 |
| | Pointe Coupee | 3 | 0 | 0.60 | | Caddo | 8 | 3 | 0.20 |
| | W. Baton Rouge | 0 | 1 | 0.19 | | Claiborne | 0 | 0 | 0.00 |
| | W. Feliciana | 1 | 0 | 0.36 | | De Soto | 0 | 1 | 0.17 |

| Region | Parish | 1990-2000 Cases | 2001-2011 Cases | 1990-2011 Ave. Rate | | Parish | 1990-2000 Cases | 2001-2011 Cases | 1990-2011 Ave. Rate |
|--------|-----------------|-----------------|-----------------|---------------------|---|--------------|-----------------|-----------------|---------------------|
| 3 | Assumption | 1 | 1 | 0.40 | | Natchitoches | 0 | 1 | 0.12 |
| | Lafourche | 2 | 1 | 0.15 | | Red River | 1 | 0 | 0.48 |
| | St. Charles | 0 | 0 | 0.00 | | Sabine | 0 | 0 | 0.00 |
| | St. James | 0 | 0 | 0.00 | | Webster | 1 | 1 | 0.22 |
| | St. John | 0 | 0 | 0.00 | | Caldwell | 0 | 0 | 0.00 |
| | St. Mary | 0 | 3 | 0.26 | | E. Carroll | 0 | 0 | 0.00 |
| | Terrebonne | 10 | 6 | 0.70 | | Franklin | 0 | 0 | 0.00 |
| 4 | Acadia | 1 | 1 | 0.15 | 8 | Jackson | 0 | 0 | 0.00 |
| | Evangeline | 0 | 0 | 0.00 | | Lincoln | 1 | 2 | 0.30 |
| | Iberia | 1 | 2 | 0.19 | | Madison | 0 | 0 | 0.00 |
| | Lafayette | 0 | 5 | 0.11 | | Morehouse | 1 | 0 | 0.14 |
| | St. Landry | 1 | 4 | 0.27 | | Ouachita | 3 | 1 | 0.12 |
| | St. Martin | 1 | 2 | 0.28 | | Richland | 0 | 0 | 0.00 |
| | Vermilion | 0 | 0 | 0.00 | | Tensas | 0 | 0 | 0.00 |
| 5 | Allen | 0 | 0 | 0.00 | 9 | Union | 1 | 2 | 0.61 |
| | Beauregard | 0 | 1 | 0.13 | | W. Carroll | 0 | 0 | 0.00 |
| | Calcasieu | 1 | 2 | 0.08 | | Livingston | 2 | 5 | 0.31 |
| | Cameron | 0 | 0 | 0.00 | | St. Helena | 0 | 0 | 0.00 |
| | Jefferson Davis | 1 | 0 | 0.15 | | St. Tammany | 10 | 5 | 0.37 |
| 6 | Avoyelles | 0 | 0 | 0.00 | | Tangipahoa | 1 | 6 | 0.28 |
| | Catahoula | 0 | 0 | 0.00 | | Washington | 7 | 7 | 1.42 |

1989 Washington Parish Outbreak

Between October 10 and November 13, 1989, 33 patients were hospitalized with laboratory-confirmed Legionnaires' disease in Washington Parish. Fourteen persons in the area died of pneumonia during the period of the outbreak. Two of the decedents were autopsied and *Legionella pneumophila* serogroup 1 (Lp-1) was identified in lung specimens from both.

A case-control study of 28 cases and 56 controls demonstrated an association between shopping at a local grocery and the disease. Among confirmed case-patients and controls that shopped at the grocery, significant associations were identified with shopping duration (longer than 30 minutes), and acquiring produce items near an ultrasonic mist machine. The mist machine continually generated an aerosol over one section of the produce display. Lp-1 was eventually isolated from water in the reservoir of the mist machine. A serosurvey revealed that employees of the grocery store in question were more likely than employees of other grocery stores in the area to have elevated antibody titers to *Legionella*. The mist machine was removed from the establishment.

Diagnosis of Hospitalized Patients

Legionnaires' disease was the main diagnosis for 59.9% of all hospitalized Legionnaires' cases from 1999 to 2010 in Louisiana.

Mortality Among Hospitalizations

The mortality of hospitalized cases varied from 0% to 20%, and the total mortality of hospitalizations over the period of 1999-2010 was 9.2% (Table 2).

Table 2. Mortality of Legionella Hospitalizations – Louisiana, 1999-2010

| Year | Hospitalizations | Death | % Mortality |
|--------------|------------------|-----------|-------------|
| 1999 | 12 | 0 | 0.0% |
| 2000 | 9 | 0 | 0.0% |
| 2001 | 9 | 0 | 0.0% |
| 2002 | 7 | 1 | 14.3% |
| 2003 | 11 | 2 | 18.2% |
| 2004 | 18 | 2 | 11.1% |
| 2005 | 5 | 1 | 20.0% |
| 2006 | 24 | 3 | 12.5% |
| 2007 | 14 | 1 | 7.1% |
| 2008 | 15 | 0 | 0.0% |
| 2009 | 16 | 3 | 18.6% |
| 2010 | 12 | 1 | 8.3% |
| Total | 152 | 14 | 9.2% |